

EFFECT OF SODIUM BUTYRATE AND ROSEMARY LEAF MEAL ON GROWTH PERFORMANCE AND CARCASS TRAITS OF BROILER CHICKENS

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ABSTRACT

The effect of Sodium butyrate, Rosemary leaf meal and Oxytetracycline supplementation on growth performance, carcass characteristics, visceral organs sizes and nutrient digestibility of broilers was investigated. A total of 192 one-day-old mixed sex “Arbor acre strain” broiler chicks were allotted to 6 dietary treatments with 4 replicates of 8 birds each in a completely randomized design (CRD). The study lasted for eight weeks. The treatments include: T1= Basal diet (BD: Negative control), T2 = BD + 1g/Kg diet of Oxytetracycline (Positive control), T3= BD + 2g SB /kg diet, T4= BD + 4g SB/Kg diet, T5 = BD + 2.5g RM/kg diet and T6= BD +5.0g RM/kg diet. Birds fed T3, T4, and T5 had the highest ($p<0.05$) body weight with an improved feed conversion ratio. The dressed weight, breast weight and drumstick/thigh weight were better ($p<0.05$) for birds fed T3, T4 and T5. It was concluded that, T3, T4, and T5 can be safely included for an improved performance and cut yields.

Key words: Butyrate, Rosemary, antibiotics, performance, carcass.

INTRODUCTION

One of the quickest ways of producing a high-quality and quantity protein for human consumption is through broiler production, because of its low fat content with high protein and amino acid balance (Sleman *et al.* 2015). Many synthetic feed additives (antibiotic feed promoter) have been used not only to improve feed efficiency but also to improve the productive performance and improve the health of broilers (Hassan *et al.* 2018). Meanwhile the harmful effects of the use of antibiotic growth promoters such as, penicillin, tetracycline, macrolide, aminoglycoside and amphenicol have been detected in foods (Diarra and Malouin, 2014). However, in modern animal production, the removal of antibiotics in animal diet (due to its effect on the health of both animal and human) has been the primary focus of the scientists as they research for alternative to antibiotics. The search for synthetic antibiotic replacement involves the use of natural substances that are safe, increase performance without harmful residue on poultry products, and some of these natural additives include Sodium butyrate and Rosemary powder. The present study was designed to investigate the effects of different inclusion levels sodium butyrate and rosemary leaf meal on growth performance and carcass characteristics in “Arbor acres strain” broilers.

MATERIALS AND METHODS

The study was carried out at the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. One hundred and Ninety-two (192) day old broilers (Anak strain) were randomly divided into six groups of thirty-two birds each. The groups were randomly assigned to six experimental diets containing T1= Basal diet (BD: Negative control) , T2 = BD + 1g/Kg diet of Oxytetracycline (Positive control), T3= BD +2g SB/kg diet, T4= BD + 4g SB/Kg diet, T5 BD + 2.5g RM/kg diet, T6= BD + 5.0g RM/kg diet. The nutrient percentage of Starter and finisher feeds is shown in Table 1. Each treatment was replicated four times with eight birds per replicate in a 2.6m x 3m length pens. The birds were housed in cages with fresh wood shavings as litter. Feed and water were offered *ad libitum* every morning from 7.00am -8.00am and general flock prophylactic management and routine vaccinations were administered. The proximate analysis was carried out according to the procedure of the association of Official Agricultural Chemists (AOAC, 2006) methods. Data collected were subjected to analysis of variance for Completely Randomized Design as described by Steel and Torrie (1980) using general linear model Procedure of SAS (2010).

RESULTS AND DISCUSSION

Table 2 shows the growth performance of broiler birds fed diets containing sodium butyrate and rosemary leaf meal. All the growth parameters considered in this study were significantly ($P<0.05$) affected by the treatments at all phases. The result showed that, birds fed T1 consumed less ($p<0.05$) feed with a poor body weight gain; while, those fed T3 had the highest feed intake. The body weight gain was highest ($p<0.05$) for birds fed T3, though, statistically the same with those that received dietary T2, T4, and T5. A better ($p<0.05$) FCR value was seen in birds fed T4 compared with those in other treatments. The overall phase presents a higher ($p<0.05$) body weight gain recorded for birds fed T3, T4, T5 and T6 while a better ($p<0.05$) feed conversion to meat ratio was seen in birds fed T4, and T5. Birds fed T1 had the least ($p<0.05$) feed intake as well as body weight gain. The results of this study is in agreement with the findings of Panda *et al.* (2009) and Sikandar *et al.* (2017) who reported that the inclusion of sodium butyrate (SB) at 4g/kg in the diet of broiler chicken performed better than antibiotics in improving BWG of birds with a superior feed efficiency. According to Chamba *et al.* (2014), sodium butyrate improved the body weight of broilers, and they attributed it to the beneficial effect of sodium butyrate in promoting the intestinal epithelium cell development and modulating intestinal symbiotic growth. According to Zhang *et al.* (2011) and Chamba *et al.* (2014), the improved performance of broiler chickens fed dietary sodium butyrate may be attributed to better feed utilization through improved villus height.

Table 3 shows the carcass characteristics of broiler birds fed different supplemental levels of sodium butyrate and rosemary leaf meal. Birds fed sodium butyrate and rosemary leaf meal showed significant differences ($p<0.05$) in all the carcass traits measured. The result showed that the live weight, dressed weight, wings and drumstick/thigh were higher ($p<0.05$) for birds fed T3 compared with those fed other dietary treatments, while birds fed T1 (Control) had the lowest ($p<0.05$) live weight, dressed weight, wings and drumstick/thigh weight values. Birds fed T2 and T3 had the highest ($p<0.05$) neck weight values compared with those fed other treatments. Breast-meat, back cut and shank weight was lowest ($p<0.05$) for birds fed T1, while birds fed T3 had the highest ($p<0.05$) breast-meat, back cut and shank weight. The highest carcass weight was recorded for birds fed 2.5g RM/kg (T5) diet and 5g RM/kg (T6) diet at single level of inclusion. The improvements in the cut yield could be very important to the poultry industry because there is a tendency to sell cuts than the whole carcass due to the increase in aggregate value (Oyeagu *et al.* 2019). The results of the present study is in line with the findings of Leeson *et al.* (2005), Panda *et al.* (2009) and Raza, *et al.* (2019) who reported higher carcass yield, dressed weight and breast-meat in broilers fed 0.2 % butyrate in the diet. They attributed the increase to better feed absorption and utilization which resulted to an improved performance and increased carcass yield.

CONCLUSION

In conclusion, up to 2 g/kg sodium butyrate, 4 g/kg sodium butyrate, or 2.5 g/kg rosemary leaf meal can be supplemented in the chicken diets for improved absorption of nutrients, growth traits and better cut yields. It was therefore recommended that up to, 4 g/kg sodium butyrate, or 2.5 g/kg rosemary leaf meal can be successfully used as a replacement to antibiotics

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Table 1: Percentage compositions of the experimental diets

Ingredients (%) Diets	Starter(kg)	Finisher(kg)
Maize	40.00	43.00
Soybean meal	33.6	22.00
Groundnut cake	24.00	16.00
Palm kernel cake	10.40	16.00
Fish meal	3.00	2.00
Fixed ingredients*	13.00	13.00
TOTAL	100	100
Calculated Composition:		
Crude protein (%)	23.36	20.12
Energy(Mcal/kg ME)	2.87	2.93
Crude fibre(%)	4.91	4.39

Fixed ingredients: 8% wheat offal, 4% bone meal, 0.25% iodized salt, 0.25% Vit-min Premix, 0.25% methionine, 0.25 lysine. Vitamin A: 10,000.00 IU., Vitamin D3: 2,000 IU., Vitamin B1: 0.75g., Vitamin B2: 5g., Nicotinic acid:25g., Vitamin B1: 2-0.015g., K3: 2.5g., E: 25g., Biotin: 0.050g., Folic acid: 1g., Calcium pantothenate: 12.5g., Choline chloride: 250g. Manganese: 64g., Cobalt: 0.8g., Copper: 8g., Manganese: 64g., Iron: 32g., Zn: 40g., Iodine: 0.8g., Selenium 0.6g., Flavomycin: 100g., Spiramycin: 5g., DL-methionie-50g, Lysine 120g.

Table 2: The effect of Sodium butyrate and Rosemary meal on feed intake, body weight gain and feed conversion ratio of broiler chicks

Treatments*	T1	T2	T3	T4	T5	T6	SEM
Parameters							
Daily performance							
Initial weight (g)	43.75	43.00	43.50	43.50	43.70	43.50	0.07
Daily feed intake (g)	92.52 ^c	106.49 ^{ab}	113.01 ^a	103.55 ^b	108.86 ^{ab}	114.11 ^a	1.40
Daily weight gain (g)	39.20 ^c	46.12 ^{ab}	48.32 ^a	47.24 ^a	48.04 ^a	46.48 ^{ab}	1.63
Starter phase							
Feed intake (g)	1299.90 ^c	1620.00 ^a	1620.10 ^a	1569.90 ^b	1678.50 ^a	1630.00 ^a	19.28
Body weight gain (g)	621.41 ^c	745.19 ^b	826.81 ^{ab}	809.94 ^{ab}	883.75 ^a	845.41 ^a	15.09
FCR (g g ⁻¹)	2.09 ^{ab}	2.17 ^a	1.96 ^b	1.94 ^b	1.90 ^c	1.93 ^b	0.02
Finisher phase							
Feed intake (g)	3881.10 ^d	4343.60 ^c	4708.80 ^b	4229.20 ^c	4417.70 ^{bc}	4760.00 ^b	65.56
Body weight gain (g)	1573.70 ^d	1837.40 ^{ab}	1879.20 ^a	1835.30 ^{ab}	1806.90 ^{ab}	1757.70 ^b	28.30
FCR (g g ⁻¹)	2.47 ^{bc}	2.36 ^c	2.51 ^{bc}	2.30 ^d	2.44 ^{bc}	2.71 ^{ab}	0.03
Overall phase							
Feed intake (g)	5181.00 ^c	5963.60 ^{ab}	6328.90 ^a	5799.10 ^b	6096.20 ^{ab}	6390.00 ^{ab}	78.60
Body weight gain (g)	2195.11 ^c	2582.59 ^b	2706.01 ^a	2645.24 ^a	2690.65 ^a	2603.11 ^a	34.90
FCR (g g ⁻¹)	2.36 ^b	2.31 ^b	2.34 ^b	2.19 ^c	2.26 ^c	2.45 ^{ab}	0.02

^{a,b,c,d}Row means with different superscripts differ significantly. SEM: Standard error of the mean, T1= Basal diet (BD: Negative control) T2 = BD + 1g/Kg diet of Oxytetracycline (Positive control), T3= BD + 2g SB/kg diet, T4= BD + 4g SB/Kg diet, T5 = BD + 2.5g RM/kg diet, T6= BD + 5.0g RM/kg diet

Table 3: The effect of Sodium butyrate and Rosemary meal on carcass characteristics of broiler chicks

Treatments*	T1	T2	T3	T4	T5	T6	SEM
Parameters							
Live weight (g)	1930.00 ^d	2725.00 ^{bc}	3710.00 ^a	2850.00 ^b	2825.00 ^b	2751.11 ^{bc}	80.40
Dressed weight (g)	1366.00 ^e	2124.00 ^{bc}	2948.00 ^a	2217.00 ^b	2304.00 ^b	2065.00 ^c	64.53
Wings (g)	169.00 ^e	208.00 ^c	269.00 ^a	211.00 ^c	207.00 ^c	229.00 ^b	4.64
Drumstick/thigh (g)	384.00 ^e	576.00 ^c	816.00 ^a	577.00 ^c	607.00 ^c	610.00 ^{bc}	17.84
Neck (g)	52.00 ^d	84.00 ^a	84.00 ^a	76.25 ^b	73.00 ^b	66.00 ^c	1.79
Breast-meat (g)	337.00 ^e	655.00 ^c	929.00 ^a	697.00 ^b	732.25 ^b	558.00 ^d	23.84
Back cut (g)	303.00 ^e	419.00 ^c	584.00 ^a	508.20 ^b	494.00 ^b	409.00 ^c	12.46
Shank (g)	48.00 ^d	57.00 ^c	105.00 ^a	57.00 ^c	59.00 ^c	78.00 ^b	2.85

^{a,b,c,d,e}Row means with different superscripts differ significantly. SEM: Standard error of the mean, T1= Basal diet (BD: Negative control) T2 = BD + 1g/Kg diet of Oxytetracycline (Positive control), T3= BD + 2g SB/kg diet, T4= BD + 4g SB/Kg diet, T5 = BD + 2.5g RM/kg diet, T6= BD + 5.0g RM/kg diet